A nonwoven material having elastic properties, a method of manufacturing it and an apparatus to carry out the method

Claims

1. A nonwoven material having elastic properties aligned in one direction, consisting of:
either one multilayer composite including at least one layer in which fibers or filaments made of an elastic polymer are contained,
or of a homogeneous fiber and filament mix in which a portion of the fibers consists of an elastic polymer,
wherein in each case a larger part of the fibers or filaments is aligned in a direction under the application of heat which extends transversely to the direction in which the nonwoven material is elastic.

2. A nonwoven material in accordance with claim 1, wherein the multilayer composite contains elastic meltblown fibers and spunbond fibers.

3. A nonwoven material in accordance with either of claims 1 or 2, wherein the elastic meltblown fibers contain bicomponent fibers having an elastic portion.

4. A nonwoven material in accordance with any of claims 1 to 3, wherein the spunbond fibers are not elastic.

5. A nonwoven material in accordance with claim 1, wherein the homogeneous fiber mix consists of a needle felt and/or a spunlaced product to which elastic fibers have been added.

6. A nonwoven material in accordance with claim 1, wherein a homogeneous fiber mix of a needle felt and/or a spunlaced product is combined with at least one layer of elastic meltblown fibers and/or spunbond fibers.

7. A nonwoven material in accordance with any of the previous claims, wherein the needle felt and the spunlaced product also include viscose or natural fibers such as cellulose in addition to synthetic fibers.

8. A nonwoven material in accordance with any one of claims 1 to 4, wherein one or more meltblown layers (M) are arranged between one or more spunbond layers (S), such as in the order SM, SMS, SMMS, SSMMS, SSMMSS, with the elastomeric layers being contained at least in one meltblown layer.

9. A nonwoven material in accordance with any one of claims 1 to 8, wherein the elastic nonwoven layer is a liquid barrier layer or a particle retention layer.

10. A nonwoven material in accordance with claim 9, wherein the property as a liquid barrier layer or a particle retention layer also remains maintained after drawing or stretching the nonwoven material.

11. A nonwoven material in accordance with any one of claims 1 to 10, wherein the product stretchability amounts to 0-700%, preferably to 50-400%.

12. A nonwoven material in accordance with any of claims 1 to 11, wherein the recovery (recovery property) of the product amounts to at least 60%, preferably to at least 80%, on a two-fold stretching by 100%.

13. A nonwoven material in accordance with any of claims 1 to 11, wherein the recovery (contracting property) of the product amounts to at least 50%, preferably to at least 70%, on a two-fold stretching by 150%.

14. A nonwoven material in accordance with any of claims 1 to 13, wherein it is breathable.

15. A nonwoven material in accordance with any of claims 1 to 14, wherein it is hydrophilic.

16. A nonwoven material in accordance with any of claims 1 to 15, wherein a polymer having elastic properties is used as the meltblown fiber and having similar flow properties (with respect to the rheological and viscosity properties) as polypropylene.

17. A nonwoven material in accordance with claim 16, wherein it can be manufactured on an industrial production plant with high productivity.

18. A nonwoven material in accordance with claim 17, wherein the meltblown fibers consist of the following mixture: more than 60% by weight of a triblock copolymer consisting of 70% by weight of styrene-ethylene/butylene-styrene and 30% by weight of styrene-ethylene/butylene, where the polystyrene portion of the polymer is 14% by weight (e.g. Kraton G®), 5-35% by weight of polypropylene suitable for processing in the meltblown method and an anti-blocking agent to improve the flow properties.

19. A nonwoven material in accordance with claim 18, wherein the meltblown fibers consist of an elastic polyolefine, for example of a metallocene-catalyzed copolymer of the polyethylene and/or polypropylene.

20. A nonwoven material in accordance with claim 18, wherein the meltblown fibers consist of a thermoplastic elastic polyurethane.

21. A nonwoven material in accordance with any of claims 1 to 20, wherein, with a multilayer design, in addition to at least one meltblown layer having elastic fibers, spunbond layers made of one of the following materials are present: of polyolefine or polyester, or bicomponent polymer based on polypropylene and polyethylene, or of a polypropylene or polyester mixed with a bicomponent polypropylene/polyethylene or of an elastic polymer such as polyurethane, polystyrene block copolymer or an elastic polypropylene and/or polypropylene.

22. A nonwoven material in accordance with claim 21, wherein the spunbond layers and/or meltblown layers have a different design.

23. A nonwoven material in accordance with any of claim 1 to 22, wherein the layers of the multilayer design are bonded to one another by needlepunching, spunlacing, by thermobonding, by calendering with smooth rolls and/or engraved rolls and or by infrared bonding.

24. A nonwoven material in accordance with any of the preceding claims, wherein the basis weight of the multilayer design amounts to 7 g/m^2 up to 400 g/m^2, where the elastic meltblown layers amount to 1 to 60% by weight.

25. A nonwoven material in accordance with any one of the preceding claims, wherein the basis weight of the needle nonwoven/spunlaced product or

needle nonwoven together with elastic meltblown layers amounts to 40-700 g/m^2, where the elastic meltblown layers amount to 1 to 60% by weight.

26. A nonwoven material in accordance with any of the preceding claims, wherein the meltblown layer provided with elastic properties has a fiber thickness of 0.01 to 1.2 denier, preferably 0.01 to 0.5 denier.

27. A method of manufacturing a nonwoven material in accordance with any of claims 1 to 26, characterized in that the prefabricated nonwoven material web is drawn either in the running direction or transversely to the running direction for the aligning of the fibers/filaments under the application of heat.

28. A method in accordance with claim 27, wherein the transport speed in the longitudinal direction, measured in %, is lowered by more than the width increase in % to generate the elastic properties of the nonwoven material in the longitudinal direction and the increase of the basis weight belonging thereto.

29. A method in accordance with claim 27, wherein the width restriction, measured in %, is higher than the increase of the transport speed in the longitudinal direction, measured in %, to generate the elastic properties of the nonwoven material in the transverse direction and the increase of the basis weight belonging thereto.

30. An apparatus for the carrying out of the method in accordance with any of the preceding claims, characterized in that it has an oven and at least one drawing device to draw the nonwoven material web.

31. An apparatus in accordance with claim 30, wherein the drawing device to draw the nonwoven material web in the direction transverse to its transport

direction has two wheel-shaped gripping apparatuses arranged to the side of the nonwoven material web and having receiving regions arranged at its periphery to grip the nonwoven material web.

32. An apparatus in accordance with any of the preceding claims, wherein the drawing device to draw the nonwoven material web in the direction longitudinal to its transport direction consists of at least two rolls via which the nonwoven material web is fixed by friction, wherein it is pulled at a speed higher in comparison with the entry speed of the nonwoven material web into the oven so that the nonwoven material web is drawn in the longitudinal direction.

33. An apparatus in accordance with any of the preceding claims, wherein the drawing device to draw the nonwoven material web in the direction longitudinal to its transport direction consists of at least two oppositely disposed rolls between which the nonwoven material web is clamped and which are drivable at a higher peripheral speed than entry speed of the nonwoven material web into the oven so that a drawing of the nonwoven material web in the longitudinal direction takes place.

34. An apparatus in accordance with any of the preceding claims, wherein a temperature is set in the oven between the softening point and the melting point of the respectively processed thermoplastic fibers.

35. An apparatus in accordance with any of the preceding claims, wherein the drawing/pulling speed of the nonwoven material web amounts to 5 – 150 m/min, preferably to 40 – 100 m/min, on the drawing into the width.

36. An apparatus in accordance with any of the preceding claims, wherein the processing speed of the nonwoven material web amounts to 5 – 400 m/min, preferably to 80 – 250 m/min, on the drawing in the longitudinal direction.